INFORMATION SHEET

ORDER NO.
CITY OF PATTERSON
WATER QUALITY CONTROL FACILITY
STANISLAUS COUNTY

Background

The City of Patterson wastewater facility is located approximately three miles northeast of Patterson, at 14901 Poplar Avenue in Stanislaus County. The facility is located along the west bank of the San Joaquin River and treats wastewater from the City of Patterson, the Villa Del Lago commercial development and Diablo Grande (a residential and golf course resort community located approximately seven miles southwest of the City). The City's previous Waste Discharge Requirements (WDRs) Order 5-00-146 prescribes requirements for the treatment discharge of up to 1.3 million gallons per day (mgd) of wastewater to 12 evaporation/percolation ponds encompassing approximately 80 acres. However, because these WDRs do not reflect the expansion of the Wastewater Treatment Plant (WWTP) to 3.5 mgd, updated WDRs are necessary.

The current wastewater treatment and disposal system consists of the North Activated Sludge Treatment System (constructed in 1979), an Advanced Integrated Pond (AIP) System (constructed in 1999), and the South Activated Sludge Treatment System (constructed in 2005). Wastewater enters an influent pumping station designed to handle flows over 4 millon gallons per day (mgd) and is then pumped to a metering and headworks facility where it enters a mechanical bar screen and is separated into each of the different treatment systems. The activated sludge treatment process consists of screening, aeration through an oxidation ditch, aerobic digestion, solids seperation through the use of clariifers, and discharge to percolation ponds. The AIPs system consists of a series of three separate ponds (primary, secondary, and tertiary) . The primary pond is used for anaerobic digestion. Aeration occurs in both the primary and secondary ponds. The tertiary pond is used for algae sedimentation and containment. The AIP ponds are constructed with concrete aprons and contain a one foot clay bottom with a hydraulic conductivity of 1×10^{-6} cm/sec .

A total of 18 percolation ponds can receive wastewater from the north and south activated sludge treatment and AIP systems. The percolation pond embankments are constructed with onsite materials excavated from pond bottoms. Slopes of the pond embankments are 2:1 slopes on the dry sides and 2.5:1 on the sides retaining the water. The northern ponds (Ponds 15 through 18) were constructed in 2005 and the other ponds were constructed prior to 2001. Design percolation rates range from 0.02 to 0.06 inches/hour with the highest percolation rates in the northern ponds.

Initially, the monthly average inflow to the WWTP shall not exceed 2.45 mgd (existing design capacity of the treatment system). However, the monthly average inflow to the WWTP may be increased to 3.38 mgd (based on water balance calculations) if the Discharger submits an *As-Built Report* that is approved by the Executive Officer certifying the completed installation of an additional oxidation ditch and clarifier at the South Activated Sludge Treatment System.

Solids and Biosolids Disposal

Waste activated sludge (WAS) that is produced from the north activated sludge treatment process is discharged into Percolation Pond No. 1. WAS generated from the south activated sludge treatment process is sent to six biosolids drying beds, The drying beds are constructed of reinforced concrete underlain by a geotextile material and a 60-mil High Density Polyethylene (HDPE) liner. Slotted tiles are used to enhance the dewatering, and drains are present in the bottoms of each of the beds that are connected to the south activated sludge system. Two of the drying beds are covered. The Discharger proposes to install a mechanical dewatering unit where a polymer will be injected into the biosolids as it is pumped from the dewatering unit. The dewatered biosolids will then be containerized and any drainage from the dewatering unit will be returned to the treatment plant headworks. The dewatered biosolids are temporarily stored onsite at the biosolids storage and loading facility and sand drying beds at the north system until they are disposed offsite by a licensed disposal contractor.

Basin Plan, Beneficial Uses, and Regulatory Considerations

Surface water from the WWTP is to the San Joaquin River (within the Sacramento San Joaquin Delta). The *Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, Fourth Edition* (Basin Plan), designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for all waters of the Basin. Beneficial uses often determine the water quality objectives that apply to a water body. For example, waters designated as municipal and domestic supply must meet the maximum contaminant levels (MCLs) for drinking waters. The Basin Plan sets forth the applicable beneficial uses (industrial, agricultural, and domestic and municipal supply in this instance) of groundwater, procedure for application of water quality objectives, and the process for and factors to consider in allocating waste assimilation capacity.

Antidegradation

The antidegradation directives of State Water Board Resolution No. 68-16, “Statement of Policy With Respect to Maintaining High Quality Waters in California,” or “Antidegradation Policy” require that waters of the State that are better in quality than established water quality objectives be maintained “consistent with the maximum benefit to the people of the State.” Waters can be of high quality for some constituents or beneficial uses and not others. Policies and procedures for complying with this directive are set forth in the Basin Plan.

Resolution 68-16 is applied on a case-by-case, constituent-by-constituent basis in determining whether a certain degree of degradation can be justified. It is incumbent upon the Discharger to provide technical information for the Regional Board to evaluate that fully characterizes:

- All waste constituents to be discharged;
- The background water quality of the uppermost layer of the uppermost aquifer;

- The background quality of other waters that may be affected;
- The underlying hydrogeologic conditions;
- Waste treatment and control measures;
- How treatment and control measures are justified as best practicable treatment and control;
- The extent the discharge will impact the quality of each aquifer; and
- The expected degree of degradation below water quality objectives.

In allowing a discharge, the Regional Water Board must comply with CWC Section 13263 in setting appropriate conditions. The Regional Water Board is required, relative to the groundwater that may be affected by the discharge, to implement the Basin Plan and consider the beneficial uses to be protected along with the water quality objectives essential for that purpose. The Regional Board need not authorize the full utilization of the waste assimilation capacity of the groundwater (CWC 13263(b)) and must consider other waste discharges and factors that affect that capacity.

Certain domestic wastewater constituents are not fully amenable to waste treatment and control and it is reasonable to expect some impact on groundwater. Some degradation for certain constituents is consistent with maximum benefit to the people of California because the technology, energy, water recycling, and waste management advantages of municipal utility service to the State far outweigh the environmental impact of a community that would otherwise be reliant on numerous concentrated individual wastewater systems. Economic prosperity of local communities is of maximum benefit to the people of California, and therefore sufficient reason to accommodate wastewater discharge provided terms of reasonable degradation are defined and met. The proposed Order authorizes some degradation consistent with the maximum benefit to the People of the State but does not authorize pollution (i.e., violation of any water quality objective).

Groundwater monitoring has been conducted around the facility; however, additional background groundwater quality is needed, and therefore staff is unable to establish the most appropriate groundwater limits. In addition, certain aspects of wastewater treatment and control practices may not be justified as representative of Best Practicable Treatment and Control (BPTC). Reasonable time is necessary to gather specific information about the WWTP to make informed, appropriate, long-term decisions. This Order, therefore, establishes interim groundwater limitations to assure protection of the beneficial uses of groundwater of the State pending the completion of certain tasks and provides time schedules to complete those tasks. During this period, degradation may occur from certain constituents, but cannot exceed water quality objectives (or natural background water quality should it exceed objectives) or cause nuisance.

According to the Basin Plan, water quality objectives define the least stringent limits that could apply as water quality limitations for groundwater at this location, except where natural background quality unaffected by the discharge of waste already exceeds the objective. The interim groundwater limits below apply numeric and narrative water quality objectives that must be met to maintain specific beneficial uses of groundwater. The constituents listed are

those that are expected to be found in treated domestic wastewater or to be released from the soil upon the application of such waste. The *Policy for Application of Water Quality Objectives* in Chapter IV of the Basin Plan provides a mechanism to apply narrative objectives using relevant and appropriate numeric limits published by other agencies and organizations. Due to the expected high quality of natural background groundwater in the location of the discharge, numeric limits were selected so as to require that conditions of nuisance, adverse tastes and odors, toxicity, or impact to sensitive agricultural uses would not be expected to occur. For the same reason, where incorporated drinking water MCLs are expressed as ranges, limits were selected that represent no impact on the municipal or domestic supply beneficial use. Unless natural background for a constituent proves to be higher, the groundwater quality limit established in proposed Order is the most stringent of the values for the listed constituents. Once the discharger provides information on background water quality and best practicable treatment or control, the groundwater limits may need to be adjusted (see *Reopener* below).

Constituent	Units	Limit	Beneficial Use	Water Quality Objective	Criteria or Justification
Ammonia	mg/L	1.5	MUN [1]	Tastes and Odors	Odor Threshold [2]
Boron	mg/L	0.7	AGR [3]	Chemical Constituents	Protect sensitive crops [4]
	mg/L	1.0	MUN[1]	Toxicity	Calif. Drinking Water Notification Level based on toxicity[11]
Chloride	mg/L	106	AGR [3]	Chemical Constituents	Sensitivity of certain crops irrigated via sprinklers [4]
		142	AGR [3]	Chemical Constituents	Chloride sensitivity on certain crops [4]
		250	MUN [1]	Chemical Constituents	Recommended Secondary MCL [5]
		500	MUN [1]	Chemical Constituents	Upper Secondary MCL [5]
Iron	mg/L	0.3	MUN [1]	Chemical Constituents	Secondary MCL [6]
Manganese	mg/L	0.05	MUN [1]	Chemical Constituents	Secondary MCL [6]
Nitrate plus Nitrite as N	mg/L	10	MUN [1]	Chemical Constituents	Primary MCL [7]
Nitrite as N	mg/L	1	MUN [1]	Chemical Constituents	Primary MCL [7]
Sodium	mg/L	69	AGR [3]	Chemical Constituents	Sensitivity of certain crops [4]
Total Dissolved Solids	mg/L	450[8]	AGR [3]	Chemical Constituents	Crop sensitivity [4]
		500	MUN [1]	Chemical Constituents	Recommended Secondary MCL [5]
		1,000	MUN [1]	Chemical Constituents	Upper Secondary MCL [5]
Total Coliform Organisms	MPN/100 ml	<2.2	MUN [1]	Bacteria	Basin Plan and non-detect
Trihalomethanes	µg/L	80	MUN [1]	Chemical	MCL [8]

Constituent	Units	Limit	Beneficial Use	Water Quality Objective Constituents	Criteria or Justification
Bromoform	µg/L	4	MUN [1]	Toxicity	USEPA IRIS Cancer Risk Level [9]
Bromodichloromethane	µg/L	0.27	MUN [1]	Toxicity	Cal/EPA Cancer Potency Factor [12]
Chloroform	µg/L	1.1	MUN [1]	Toxicity	Cal/EPA Cancer Potency Factor [12]
Dibromochloromethane	µg/L	0.37	MUN [1]	Toxicity	Cal/EPA Cancer Potency Factor [12]
pH	pH Units	6.5 to 8.5	MUN [1]	Chemical Constituents	Secondary MCL [10]
		6.5 to 8.4	AGR [3]	Chemical Constituents	Protect sensitive crops [4]

1 Municipal and domestic supply
2 J.E. Amoore and E. Hautala, *Odor as an Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatilities for 214 Industrial Chemicals in Air and Water Dilution*, Journal of Applied Toxicology, Vol. 3, No. 6 (1983).
3 Agricultural supply
4 Ayers, R. S. and D. W. Westcot, Water Quality for Agriculture, Food and Agriculture Organization of the United Nations – Irrigation and Drainage Paper No. 29, Rev. 1, Rome (1985)
5 Title 22, California Code of Regulations (CCR), Section 64449, Table 64449-B which is incorporated by reference into the Basin Plan.
6 Title 22, CCR, Section 64449, Table 64449-A which is incorporated by reference into the Basin Plan.
7 Title 22, CCR, Section 64431, Table 64431-A which is incorporated by reference into the Basin Plan.
8 Title 22, CCR, Section 64439, which applies the narrative objective to fully protect the cited beneficial use.
9 USEPA Integrated Risk Information System, http://www.epa.gov/iris.
10 Title 40, Code of Federal Regulations, Section 143.3, which applies the narrative objective to fully protect the cited beneficial use.
11 California Department of Health Services, Division of Drinking Water and Environmental Management, Drinking Water Notification Levels, http://www.dhs.ca.gov/ps/ddwem.
12 CAL/EPA Toxicity Criteria Database (OEHHA), http://www.oehha.org/risk/ChemicalDB.

Domestic wastewater contains numerous dissolved organic and inorganic constituents that together comprise Total Dissolved Solids (TDS). Each component constituent is not individually critical to any beneficial use. Critical constituents are individually listed. The cumulative impact from the other constituents, along with the cumulative affect of the constituents that are individually listed can be effectively controlled using TDS as a generic indicator parameter. The relevant numerical water quality limit for salinity is 450 mg/L, and is used through Basin Plan procedures to apply the narrative Chemical Constituents water quality objective for the protection of agricultural supply, the beneficial use most sensitive to TDS. This limit assumes no impact on sensitive agricultural uses, consistent with the high quality of expected natural background water quality in the area of the discharge. Most individual salt components can safely be assumed to be proportionately low such that TDS can be an effective indicator parameter in their regulation.

Not all TDS constituents pass through the treatment process and soil profile in the same manner or rate. Chloride tends to pass through both rapidly to groundwater. As chloride concentrations in most groundwaters in the region are much lower than in treated municipal

wastewater, chloride is a useful indicator parameter for evaluating the extent to which effluent reaches groundwater. Boron is another TDS constituent that may occur in wastewater in concentrations greater than groundwater depending on the source water and the extent residents use cleaning products containing boron. Other indicator constituents for monitoring for groundwater degradation due to recharged effluent include total coliform bacteria, ammonia and total nitrogen, and Total Trihalomethanes (TTHMs), a by-product of chlorination.

Treatment Technology and Control

Given the character of domestic wastewater, secondary treatment technology is generally sufficient to control degradation of groundwater from decomposable organic constituents. Adding disinfection significantly reduces populations of pathogenic organisms, and reasonable soil infiltration rates and unsaturated soils can reduce them further. Neither organics nor total coliform organisms, the indicator parameter for pathogenic organisms, should be found in groundwater in a well-designed, well-operated facility. The bacteria objective in the Basin Plan, cited as a groundwater limitation in the order, is equivalent to requiring that coliform organisms not be detected in groundwater.

Domestic wastewater typically contains nitrogen in concentrations greater than water quality objectives, which vary according to the form of nitrogen. Groundwater degradation by nitrogen can be controlled by an appropriate secondary treatment system (e.g., oxidation ditch), tertiary treatment with nitrogen reduction, and agronomic reuse crops that are harvested and removed from the land application area. The effectiveness varies, but generally best practicable treatment and control is able to control nitrogen degradation of groundwater at a concentration well below the water quality objectives. The proposed interim limitation reflects water quality objectives.

Dissolved solids can pass through the treatment process and soil profile; effective control of such constituents relies primarily upon source control and pretreatment measures. In the best of circumstances, long-term land discharge of treated wastewater will degrade groundwater with dissolved solids (as measured by TDS and EC). The quality of source water for the City is fairly good, with a TDS of approximately 877 mg/L. Salt addition through use higher than the expected range, as effluent reveals a TDS of approximately 1,248 mg/L. For comparison, the national average increment for TDS ranges from 100 to 300 mg/L, according to *Wastewater Engineering* by Metcalf & Eddy; the incremental maximum in the Basin Plan for the Tulare Lake Basin is 500 umhos/cm (about 300 mg/L); and the incremental average standard allowed in the Santa Ana Basin in 230 mg/L. The proposed Order sets for interim effluent limits at the current discharge concentration, while requiring the development of salinity reduction BPTC measures.

Other constituents in domestic wastewater that may pass through the treatment process and the soil profile, include recalcitrant organic compounds, radionuclides, and pharmaceuticals. Hazardous compounds are not usually associated with domestic wastewater and when present are reduced in the discharge to inconsequential concentrations through dilution and

treatment. It is inappropriate to allow degradation of groundwater with such constituents, so proposed limits are nondetectable concentrations.

A discharge of treated wastewater water that overloads soils with nutrients and organics can result in anaerobic conditions in the soil profile, which in turn creates organic acids and decreases soil pH. Under conditions of low soil pH (below 5), iron and manganese compounds in the soil can solubilize and leach into groundwater. Overloading the land application areas is preventable. Though iron and manganese limits are set at the water quality objective, groundwater pH is expected to remain the same as background.

Title 27

Title 27, CCR, Section 20005 et seq. ("Title 27"), contains regulations to address certain discharges to land. Title 27 establishes a waste classification system, specifies siting and construction standards for containment of classified waste, requires extensive monitoring of groundwater and the unsaturated zone for any indication of failure of containment, and specifies closure and post-closure maintenance requirements. Generally, no degradation of groundwater quality by any waste constituent is acceptable under Title 27 regulations.

Discharges of domestic sewage and treated wastewater can be treated and controlled to a degree that will not result in unreasonable degradation of groundwater. For this reason, they have been conditionally exempted from Title 27. Discharges of domestic sewage and treated effluent which are regulated by WDRs and treatment and storage facilities associated with the WWTP are considered exempt from Title 27 under Section 20090(a), provided that the discharges and facilities will not result in a violation of any water quality objective. As the exemption specifically excludes the discharge to land of: 1) solid waste such as grit and screenings that result from treatment of domestic sewage, and 2) residual sludge that will not be further treated at the WWTP, such discharges must comply with provisions of Title 27.

The discharge of treated wastewater and the operation of treatment and/or storage facilities associated with a wastewater treatment plant can be allowed without requiring compliance with Title 27 only if groundwater degradation complies with the Basin Plan, Resolution No. 68-16 (Antidegradation Policy), and does not violate any water quality objectives.

Proposed Order Terms and Conditions

Discharge Prohibitions and Specifications

The Order requires the Discharger to submit a technical report documenting that the following improvements to produce a higher quality effluent from the North Activated Sludge Treatment System has been completed. Those improvements include: (a) install new brush aerators equipped with on/off timers to replace the existing equipment to control dissolved oxygen levels in the oxidation ditch, (b) replace the three existing pumps at the north RAS pump station with two new pumps, (c), independently use the two existing magnetic effluent flow meters to measure flows to the AIPs and the north oxidation ditch, (d) sandblast and recoat all of the steel equipment associated with the north clarifier no. 1 to prevent further corrosion from damaging the collector mechanism and effluent trough and (e) install an effluent pump

station and pipeline that will allow secondary effluent to be pumped into Pond No. 12 instead of Pond No.6.

The Order allows the monthly average inflow rate to the WWTP to increase to 3.38 mgd based on submittal, and approval by the Executive Officer, of an *As-Built Report* certifying the completed installation of an additional oxidation ditch and clarifier at the South Activated Sludge Treatment System.

The Order's Effluent Limitations for BOD_5 and TSS are based on information provided in the RWD. The RWD states that the additional oxidation ditch and clarifier at the South Activated Sludge Treatment System will consist of a biological oxygen nutrient removal oxidation ditch and a single secondary clarifier producing average daily effluent limits of less than 20 mg/L BOD, 20 mg/L Total Suspended Solids (TSS), and 10 mg/L total nitrate measured as nitrogen.

The Order's TDS Effluent Limitation for TDS is based on average effluent quality data provided in the August 2005 through December 2006 monthly monitoring reports, and is an interim limit based on current conditions. The Discharger is expected to provide a final effluent limit that will be protective of water quality. The discharge specifications regarding dissolved oxygen and freeboard are consistent with Regional Board policy for the prevention of nuisance conditions and overtopping, and are applied to all such facilities.

Monitoring Requirements

Section 13267 of the CWC authorizes the Regional Board to require monitoring and technical reports as necessary to investigate the impact of a waste discharge on waters of the state. In recent years there has been increased emphasis on obtaining all necessary information, assuring the information is timely as well as representative and accurate, and thereby improving accountability of any discharger for meeting the conditions of discharge. Section 13268 of the CWC authorizes assessment civil administrative liability where appropriate.

The proposed Order includes influent and effluent monitoring requirements, groundwater monitoring, sludge monitoring, and water supply monitoring.

The Title 27 zero leakage protection strategy relies heavily on extensive groundwater monitoring to increase a discharger's awareness of, and accountability for, compliance with the prescriptive and performance standards. Title 27 regulations pertaining to groundwater monitoring and the detection and characterization of waste constituents in groundwater have been in effect and successfully implemented for many years. No regulation currently specifies similar criteria more suitable for a situation where extensive land application of treated wastewater occurs. It is appropriate that the Title 27 groundwater monitoring procedures be extended and applied on a case-by-case basis under Water Code Section 13267.

The Discharger must monitor groundwater for wastewater constituents expected to be present in the discharge, and capable of reaching groundwater, and violating groundwater limitations if its treatment, control, and environmental attenuation, proves inadequate. The

Discharger proposes to install five additional groundwater monitoring wells around the facility. Two of these wells will be located west and upgradient of the WWTP and used to obtain additional background groundwater quality data. The remaining three groundwater monitoring wells will be located downgradient of the WWTP and be used to monitor the downgradient groundwater quality.

For each constituent listed in the Groundwater Limitations section, the Discharger must, as part of each monitoring event, compare concentrations of constituents found in each monitoring well (or similar type of groundwater monitoring device) to the background concentration or to prescribed numerical limitations to determine compliance.

Reopener

The conditions of discharge in the proposed Order were developed based on currently available technical information and applicable water quality laws, regulations, policies, and plans, and are intended to assure conformance with them. However, information is presently insufficient to develop final groundwater limitations, so the proposed Order contains interim limitations. Additional information must be developed and documented by the Discharger as required by schedules set forth in the proposed Order. As this additional information is obtained, decisions will be made concerning the best means of assuring the highest water quality possible and that could involve substantial cost. It may be appropriate to reopen the Order if applicable laws and regulations change, but the mere possibility that such laws and regulations may change is not sufficient basis for reopening the Order. The CWC requires that waste discharge requirements implement all applicable requirements.

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